

PATENT CLAIMS

5 1. A method of sterilising a heat sensitive fluid,
characterised by:

providing the fluid as a first component, which is heat
sensitive, and a second component;

10 heating the second component to a first temperature higher
than a predetermined sterilising temperature;

mixing the first component with the second component to
thereby heat the first component and cool the second component,
whereby the mixed components obtain a mixing temperature, which
is at least equal to said sterilising temperature;

15 maintaining said mixed components at substantially said
sterilising temperature during a sterilisation time so that a
predetermined sterilisation dose is obtained; and

delivering said mixed component to a recipient.

20 2. A method as claimed in claim 1, **characterised** by
controlling the step of heating to the first temperature
to obtain a mixing temperature, which is at least equal to said
sterilising temperature.

25 3. A method as claimed in claim 1 or 2, **characterised** by
cooling said mixed components before delivery to said
recipient.

4. A method as claimed in claim 1, 2 or 3, **characterised**
in that said first component comprises glucose or a glucose
polymer.

30 5. A method as claimed in any one of the previous claims,
characterised in that said second component comprises water.

6. A method as claimed in claim 5, **characterised** in that
said second less heat sensitive component comprises water and
includes electrolytes, selected from the group of substances
comprising: sodium chloride, calcium chloride, magnesium chlo-
35 ride, potassium chloride, sodium bicarbonate and sodium lac-
tate.

7. A method as claimed in any one of the previous claims,
characterised in that said first component is preheated.

8. A method as claimed in any one of the previous claims, **characterised** in that said first and second components are maintained at a high pressure sufficient to prevent boiling of the fluids.

5 9. A method as claimed in any one of the previous claims, **characterised** in that said first and second components are provided as flows of fluid.

10 10. A method as claimed in claim 9, **characterised** in that the flow rate of the second component is larger than the flow rate of the first component.

11. A method as claimed in claim 9 or 10, **characterised** by determining the flow rate with a weighing device or a flow meter and increasing the pressure by a pump.

15 12. A method as claimed in any one of claims 9 - 11, **characterised** by sequentially sterilising several fluid components of a complex fluid.

13. A method as claimed in claim 12, **characterised** by providing sources of concentrated fluid components and pure water;

20 pumping a first concentrated fluid from said sources of concentrated fluids, to increase the pressure thereof;

pumping pure water to increase the pressure thereof and heating said pure water to said first temperature;

25 mixing said first concentrate and heated pure water and maintaining the mixed fluids at a sterilising temperature for a sterilising time to effect sterilisation;

delivering said sterilised and diluted concentrate fluid to a recipient;

30 repeating the above method steps for each of the concentrated fluid components, to provide the final complex fluid in the recipient.

14. A method as claimed in claim 13, **characterised** in that said concentrated fluid is preheated before being mixed with the heated water.

35 15. A method as claimed in claim 14, **characterised** in that said preheating is performed in a heat exchanger by heat recovery from the sterilised fluid, which is cooled thereby.

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16. A method as claimed in claim 15, **characterised** in that said second fluid is first preheated by heat recovery in a heat exchanger from the sterilised fluid, which is thereby cooled, and is further heated to said first temperature by a separate heating device, such as an electric heater.

17. A method as claimed in claim 16, **characterised** in that said further heating by a separate heating device is controlled by a temperature sensor positioned downstream of the maintaining step, to ensure that sterilising temperature is obtained.

18. A method as claimed in any one of the previous claims, **characterised** by dissolving at least one powdered substance in water to form at least one of the first and second components.

19. A method as claimed in any one of the previous claims, **characterised** by providing the fluid as third component, which is heat sensitive, in addition to said first and second components.

20. A method as claimed in claim 19, **characterised** in that the third component comprises water and at least one amino acid.

21. An apparatus for sterilising a heat sensitive fluid, **characterised** by:

a first vessel enclosing a first component, which is heat sensitive, and a second vessel for enclosing a second component of said heat sensitive fluid;

a first heating device (6) for heating the second component to a first temperature higher than a sterilising temperature;

a mixing device (8) for mixing the first component with the second component to thereby heat the first component and cool the second component, whereby the mixed components obtain a mixing temperature, which is at least equal to said sterilising temperature;

a residence device (9, 10) for maintaining said mixed components at said sterilising temperature during a sterilisation time so that a sterilisation effect is obtained; and

a delivery device (20) for delivering said mixed component to a recipient.

22. An apparatus as claimed in claim 21, **characterised** by a control device (16, 19) for controlling the heating device to obtain a mixing temperature, which is at least equal to said sterilising temperature.

5 23. An apparatus as claimed in claim 21 or 22, **characterised** by

a cooling device (13) for cooling said mixed components before delivery to the recipient.

10 24. An apparatus as claimed in claim 21, 22 or 23, **characterised** in that said first heat sensitive component comprises glucose or a glucose polymer.

25. An apparatus as claimed in any one of claims 21 - 24, **characterised** in that said second less heat sensitive component comprises water.

15 26. An apparatus as claimed in claim 25, **characterised** in that said second less heat sensitive component comprises water and includes electrolytes, selected from the group or substances comprising: sodium chloride, calcium chloride, magnesium chloride, potassium chloride, sodium bicarbonate and
20 sodium lactate.

27. An apparatus as claimed in any one of claims 21 - 26, **characterised** by a preheating device (22) for preheating said first component.

28. An apparatus as claimed in any one of claims 21 - 27, **characterised** by a pressurising device (5, 7, 20) for maintaining said first and second components at a high pressure sufficient to prevent boiling of the fluids.

29. An apparatus as claimed in any one of claims 21 - 28, **characterised** in that said first and second components are
30 flows of fluid.

30. An apparatus as claimed in claim 29, **characterised** in that the flow rate of the second component is larger than the flow rate of the first fluid flow component.

31. An apparatus as claimed in claim 29 or 30, **characterised** by a weighing device or a flow meter for determining the
35 flow rate and pump devices for increasing the pressure.

32. An apparatus as claimed in any one of claims 29 - 31, **characterised** by a device for sequentially sterilising several fluid components of a complex fluid.

33. An apparatus as claimed in claim 32, **characterised** by
5 an assembly of bags (105, 106, 107) of concentrate fluids for providing sources of concentrated fluid components and pure water from an inlet (101);

10 a concentrate pump (129) for pumping a first concentrated fluid from said sources of concentrated fluids, to increase the pressure thereof;

a water pump (117) for pumping pure water to increase the pressure thereof and a heating device (121) for heating said pure water to said first temperature;

15 a mixing device (124) for mixing said first concentrate and heated pure water and a residence device (134) for maintaining the mixed fluids at a sterilising temperature for a sterilising time to effect sterilisation;

20 delivery means (139) for delivering said sterilised and diluted concentrate fluid to a recipient, such as a bag;

25 control means (111) for controlling and repeating the above steps for each of the concentrated fluid components, to provide the final complex fluid in the recipient.

34. An apparatus as claimed in claim 33, **characterised** by a preheater (121) for preheating said concentrated fluid before
25 being mixed with the heated water.

35. An apparatus as claimed in claim 34, **characterised** by a heat exchanger (121) for heat recovery from the sterilised fluid, which is cooled thereby.

36. An apparatus as claimed in claim 35, **characterised** by
30 a heat exchanger for preheating said second fluid by heat recovery from the sterilised fluid, which is thereby cooled, and a heater (123) for further heating to said first temperature.

37. An apparatus as claimed in claim 33, **characterised** in
35 that said heater (123) is adapted to be controlled by a temperature sensor (136) positioned downstream of the residence device (134), to ensure that at least sterilising temperature is obtained.

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38. An apparatus as claimed in any one of claims 21 - 37,
characterised in that at least one of said first and second
vessel comprises at least one powdered substance for dissolu-
tion in water to form at least one of the first and second
5 components.

39. An apparatus as claimed in any one of claims 21 - 38,
characterised by a third vessel comprising a third component,
which is heat sensitive.

40. An apparatus as claimed in claims 39, **characterised** in
10 that the third component comprises water and at least one amino
acid.

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